

REMARKS

In response to the above-identified Office Action ("Action"). Applicants traverse the Examiner's rejection to the claims and seeks reconsideration thereof. Claims 1-6 and 8-20 are pending in the present application. In the instant response, claims 1, 2, 5, 9, 16 and 19 are amended, claims 21-26 are added and no claims are cancelled.

I. Claim Amendments

Claims 21-26 are added and claims 1, 2, 5, 9, 16 and 19 are amended in order to particularly point out and distinctly claim the subject matter of the present invention without adding any new matter.

In particular, claim 1 and 9 are amended to recite "wherein, under a predetermined common condition, angles of about 30°, about 45°, and about 90° of the top corners are made in response to a different etching time." Support for the amendments to claims 1 and 9 may be found, for example, in Table 1 on pages 16-17, and lines 13-19 of page 17.

Claims 2 and 16 are amended to recite "according to a contained quantity of hydrogen bromide and chlorine gas in an etching gas." This element was previously recited in claims 1 and 9.

Claims 5 and 19 are amended to recite "an angle of top corners of the trench is controlled through the use of the isotropic etching technique." Controlling an angle of the top corners of the trench is already recited in claims 1 and 9 and "the isotropic etching technique" is already recited in claims 5 and 19 therefore this element is supported by the specification.

New claim 21 recites "wherein, if the predetermined common condition for over-etching the pad layer includes a pressure of about 88 mtorr, a power of about 600 W, a CF₄ with about 50 sccm, and an Ar with about 300 sccm, the angles of about 30°, about 45°, and about 90° of the top corners are made at different etching times of about 0", about 10", and about 0". Support for new claim 21 may be found, for example, in Table 1, col. 4, pages 16-17.

New claim 22 recites “wherein, if the predetermined common condition includes a pressure of about 10 mtorr, a source power of about 1000 W, a bias power of about 275 W, a HBr with about 40 sccm, a He with about 10 torr, and a temperature of about 20 °C, the angles of about 30°, about 45°, and about 90° of the top corners are made at different etching times of about 5”, about 0”, and about 0”.” Support for new claim 22 may be found, for example, in Table 1, col. 6, pages 16-17.

New claim 23 recites “wherein, if the predetermined common condition includes a pressure of about 10 mtorr, a power of about 600 W, a bias power of about 90 w, a CF₄ with about 80 sccm, a He with about 10 torr, and a temperature of about 20 °C, the angles of about 30°, about 45°, and about 90° of the top corners are made at different etching times of about 0”, about 7”, and about 7”.” Support for new claim 23 may be found, for example, in Table 1, col. 7, pages 16-17.

New claim 24 recites “wherein, if the predetermined common condition for over-etching the pad layer includes a pressure of about 88 mtorr, a power of about 600 W, a CF₄ with about 50 sccm, and an Ar with about 300 sccm, the angles of about 30°, about 45°, and about 90° of the top corners are made at different etching times of about 0”, about 10”, and about 0”.” Support for new claim 24 may be found, for example, in Table 1, col. 4, pages 16-17.

New claim 25 recites “wherein, if the predetermined common condition includes a pressure of about 10 mtorr, a source power of about 1000 W, a bias power of about 275 W, a HBr with about 40 sccm, a He with about 10 torr, and a temperature of about 20 °C, the angles of about 30°, about 45°, and about 90° of the top corners are made at different etching times of about 5”, about 0”, and about 0”.” Support for new claim 25 may be found, for example, in Table 1, col. 6, pages 16-17.

New claim 26 recites “wherein, if the predetermined common condition includes a pressure of about 10 mtorr, a power of about 600 W, a bias power of about 90 w, a CF₃ with about 80 sccm, a He with about 10 torr, and a temperature of about 20 °C, the angles of about 30°, about 45°, and about 90° of the top corners are made at different etching times of about 0”,

about 7", and about 7'." Support for new claim 26 may be found, for example, in Table 1, col. 7, pages 16-17.

Since the amendments are supported by the specification and do not add new matter, Applicants respectfully request consideration and entry of the amendments to claims 1, 2, 5, 9, 16 and 19 and new claims 21-26.

II. Claim Rejections – 35 U.S.C. §103

A. In the outstanding Action, the Examiner rejects claims 1, 9-11, 14 and 15 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,976,951 issued to Huang et al. ("Huang₁") in view of U.S. Patent No. 5,801,083 issued to Yu et al. ("Yu"). Applicants respectfully traverse the rejections for at least the following reasons.

To establish a *prima facie* case of obviousness, the Examiner must show that the cited reference teaches or suggests each of the elements of a claim. Hindsight reconstruction may not be used to modify the reference to meet the claimed invention. MPEP § 2145. Furthermore, the fact that the claimed invention is within the capabilities of one of ordinary skill in the art, without some showing of an objective reason for modifying the reference to arrive at the claimed invention, is not sufficient to establish a *prima facie* case of obviousness. *In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000).

In regard to independent claims 1 and 9, Applicants respectfully submit Huang₁ and Yu fail to teach or suggest at least the element of "wherein, under a predetermined common condition, angles of about 30°, about 45°, and about 90° of the top corners are made in response to a different etching time" as recited in amended claims 1 and 9. Applicants respectfully submit neither Huang₁, Yu or the remaining cited references, contemplate the metaphysical relationship between the predetermined condition and etching time to create the claimed corner angles as recited in claims 1 and 9. In particular, according to the instant invention, the top corner angles of the trench can be adjusted in response to a different etching time under a predetermined common condition. The Examiner appears to recognize the failure of the references to teach this element in admitting that Huang₁ and Yu "fails to teach an angle of the top corners is controlled in a range of from about 30° to about 60°." See Action, page 8. Since the references alone or in

combination fail to teach or suggest this element, a *prima facie* case of obviousness may not be established. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 1 and 9 under 35 U.S.C. §103 over Huang₁ in view of Yu.

In regard to claims 10-11, 14 and 15, these claims depend from claim 9 and incorporate the limitations thereof. For at least the reasons discussed in regard to claim 9, the references fail to teach or suggest at least the element of “wherein, under a predetermined common condition, angles of about 30°, about 45°, and about 90° of the top corners are made in response to a different etching time” as further found in claims 10-11, 14 and 15. Since the references alone or in combination fail to teach or suggest this element, a *prima facie* case of obviousness may not be established. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 10-11, 14 and 15 under 35 U.S.C. §103 over Huang₁ in view of Yu.

B. In the outstanding Action, the Examiner rejects claims 2, 4, 5, 8, 13, 16, 18 and 19 under 35 U.S.C. §103(a) as being unpatentable over Huang₁ in view of Yu as applied to claims 1, 9 and 11, and further in view of U.S. Patent No. 6,180,466 issued to Ibok (“Ibok”). Applicants respectfully traverse the rejections for at least the following reasons.

In regard to claims 2 and 16, these claims depend from from claims 1 and 9, respectively, and therefore incorporate the limitations thereof. For at least the reasons discussed in regard to claims 1 and 9, Huang₁ and Yu fail to teach or suggest at least the element of “wherein, under a predetermined common condition, angles of about 30°, about 45°, and about 90° of the top corners are made in response to a different etching time” as further found in claims 2 and 16. Applicants respectfully submit claims 2 and 16 are further patentable over the references at least for the reason that the references fail to teach or suggest the additional element of “an angle of the top corners of the trench is controlled according to a contained quantity of hydrogen bromide and chlorine gas in an etching gas” as recited in claim 2 and “forming the trench of which top corners are rounded, the top corners of the trench are rounded according to a contained quantity of hydrogen bromide and chlorine gas in an etching gas” as recited in claim 16.

The Examiner relies upon Yu to teach this element stating that Yu teaches an etching process to make top corners of the trench rounded using a contained quantity of hydrogen bromide and chlorine gas. See Action, page 5. The Examiner alleges it would have been obvious to one skilled in the art to incorporate these features of Yu into that of Huang₁ to decrease a sharpness of the trench corner. See Action, page 5.

Applicants respectfully disagree with the Examiner's reliance on this portion of Yu to teach controlling an angle of or rounding top corners of the trench using a contained quantity of hydrogen bromide and chlorine gas. Yu teaches that use of the etchant disclosed results in a sloped trench without any corners (see Fig. 3) due to the presence of an overlying polymer spacer 6b. See Yu, col. 3, lines 40-45. Once the polymer spacer 6b is removed, an unetched space underlying spacer 6b which has a sharp corner 8a is found. See Yu, col. 3, lines 45-47. As illustrated in Figure 5, a silicon dioxide layer 9 is then applied over corner 8a to create a rounded corner. Thus, Yu teaches the use of silicon dioxide layer 9, not a contained quantity of hydrogen bromide and chlorine gas, to round the trench corners. Upon review of these portions of Yu, one of ordinary skill in the art would therefore not be motivated to use a contained quantity of hydrogen bromide and chlorine gas in Huang₁ to control a shape of the trench corners as recited in claims 2 and 16. The Examiner has further not pointed to and Applicants are unable to discern a portion of Ibok curing the deficiencies of Huang₁ and Yu with respect to this element. Thus, for at least these additional reasons, the combination of Huang₁, Yu and Ibok may not be relied upon to teach each and every element of claims 2 and 16. Since each of these elements of these claims is not found within the references, a *prima facie* case of obviousness may not be established. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 2 and 16 under 35 U.S.C. §103 over Huang₁ in view of Yu and further in view of Ibok.

Claims 4, 5, 8, 13, 18 and 19 depend from claims 1 or 9 and therefore incorporate the limitations thereof. For at least the reasons discussed in regard to claims 1 and 9, Huang₁ and Yu fail to teach or suggest at least the element of "wherein, under a predetermined common condition, angles of about 30°, about 45°, and about 90° of the top corners are made in response to a different etching time" as further found in claims 4, 5, 8, 13, 18 and 19.

The Examiner has further not pointed to a portion of Ibok teaching or suggesting this element. The Examiner alleges col. 4, lines 35-41 of Ibok teaches top corners of the trench having a range of from about 30° to about 60°. See Action, page 8. Applicants have reviewed this portion of Ibok and fails to discern a teaching of “wherein, under a predetermined common condition, angles of about 30°, about 45°, and about 90° of the top corners are made in response to a different etching time” as further found in claims 4, 5, 8, 13, 18 and 19. Instead this portion of Ibok generally teaches various oblique angle ranges for a trench top corner without expressly teaching the angles are formed according to specific predetermined common conditions or different etching times.

Since the references alone or in combination fail to teach or suggest this element, a *prima facie* case of obviousness may not be established. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 4, 5, 8, 13, 18 and 19 under 35 U.S.C. §103 over Huang₁ in view of Yu and further in view of Ibok.

C. In the outstanding Action, the Examiner rejects claims 3 and 17 under 35 U.S.C. §103(a) as being unpatentable over Huang₁, Yu and Ibok as applied to claims 2 and 16, and further in view of U.S. Publication No. 2003/0092273 issued to Downey et al (“Downey”). Applicants respectfully traverse the rejections for at least the following reasons.

Claim 3 depends from claim 1 and claim 17 depends from claim 9 and therefore claims 3 and 17 incorporate the limitations thereof. For at least the reasons previously discussed, Huang₁, Yu and Ibok fail to teach or suggest at least the element of “wherein, under a predetermined common condition, angles of about 30°, about 45°, and about 90° of the top corners are made in response to a different etching time” as further found in claims 3 and 17.

The Examiner has further not pointed to, and Applicants are unable to discern, a portion of Downey curing the deficiencies of Huang₁, Yu and Ibok with respect to this element. Since the references alone or in combination fail to teach or suggest this element, a *prima facie* case of obviousness may not be established. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 3 and 17 under 35 U.S.C. §103 over Huang₁, Yu, Ibok and further in view of Downey.

D. In the outstanding Action, the Examiner rejects claims 6 and 20 under 35 U.S.C. § 103(a) as being unpatentable over Huang₁, Yu and Ibok as applied to claims 4 and 16, and further in view of U.S. Patent No. 6,225,187 issued to Huang et al (“Huang₂”). Applicants respectfully traverse the rejections for at least the following reasons.

Claim 6 depends from claim 1 and claim 20 depends from claim 9 and therefore claims 6 and 20 incorporate the limitations thereof. For at least the reasons previously discussed, Huang₁, Yu and Ibok fail to teach or suggest at least the element of “wherein, under a predetermined common condition, angles of about 30°, about 45°, and about 90° of the top corners are made in response to a different etching time” as further found in claims 6 and 20.

The Examiner has further not pointed to, and Applicants are unable to discern, a portion of Huang₂ curing the deficiencies of Huang₁, Yu and Ibok with respect to this element. Since the references alone or in combination fail to teach or suggest this element, a *prima facie* case of obviousness may not be established. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 6 and 20 under 35 U.S.C. § 103 over Huang₁, Yu, Ibok and further in view of Huang₂.

III. New Claims

In regard to new claims 21-26, claims 21-23 depend from claim 1 and claims 24-26 depend from claim 9 and therefore incorporate the limitations thereof. Thus, for at least the reasons previously discussed, neither Huang₁, Yu, Ibok, Downey nor Huang₂ alone or in combination teach at least the element of “wherein, under a predetermined common condition, angles of about 30°, about 45°, and about 90° of the top corners are made in response to a different etching time” as further found in claims 21-26. Claims 21-26 are further not *prima facie* obvious over the references for at least the reason that the Examiner has not pointed to and Applicants are unable to discern a portion of any of Huang₁, Yu, Ibok, Downey or Huang₂ teaching the specific predetermined common conditions further recited in claims 21-26. Thus, for at least these additional reasons, claims 21-26 are neither anticipated nor obvious over Huang₁, Yu, Ibok, Downey or Huang₂.

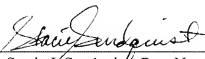
CONCLUSION

In view of the foregoing, it is believed that all claims now pending, namely claims 1-6 and 8-26, are now in condition for allowance and such action is earnestly solicited at the earliest possible date. If there are any additional fees due in connection with the filing of this response, please charge those fees to our Deposit Account No. 02-2666. Questions regarding this matter should be directed to the undersigned at (310) 207-3800.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR, & ZAFMAN LLP

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By: 
Stacie J. Sundquist, Reg. No. 53,654

12400 Wilshire Boulevard
Seventh Floor
Los Angeles, California 90025
Telephone (310) 207-3800
Facsimile (310) 820-5988

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I hereby certify that this correspondence is being submitted electronically via EFS Web to the United States Patent and Trademark Office on March 1, 2007.


Si Vuong